

# python for Computational Problem Solving - pCPS - Control Structures

## Lecture Slides - Class #11 to Class#12

---

**Nitin V Pujari**  
**Faculty, Computer Science**  
**Dean - IQAC, PES University**

# python for Computational Problem Solving Syllabus

## Unit I: Computational Problem Solving - 12 Hours

Limits of Computational Problem Solving - Computer Algorithm - Computer Hardware - Digital Computer - Operating System- Limits of IC technology - Computer Software - Syntax, semantics and program translation ,Introduction to Python Programming Language, IDLE Python Development Environment, Output function - variables, types and id,input function , operators and expressions, Control structures .

T1: 1.1 – 1.7

T1: 2.1 - 2.4

T1: 3.1 – 3.4

### ▼ 3 Control Structures

MOTIVATION

FUNDAMENTAL CONCEPTS

3.1 What Is a Control Structure?

▶ 3.2 Boolean Expressions (Conditions)

▶ 3.3 Selection Control

▶ 3.4 Iterative Control

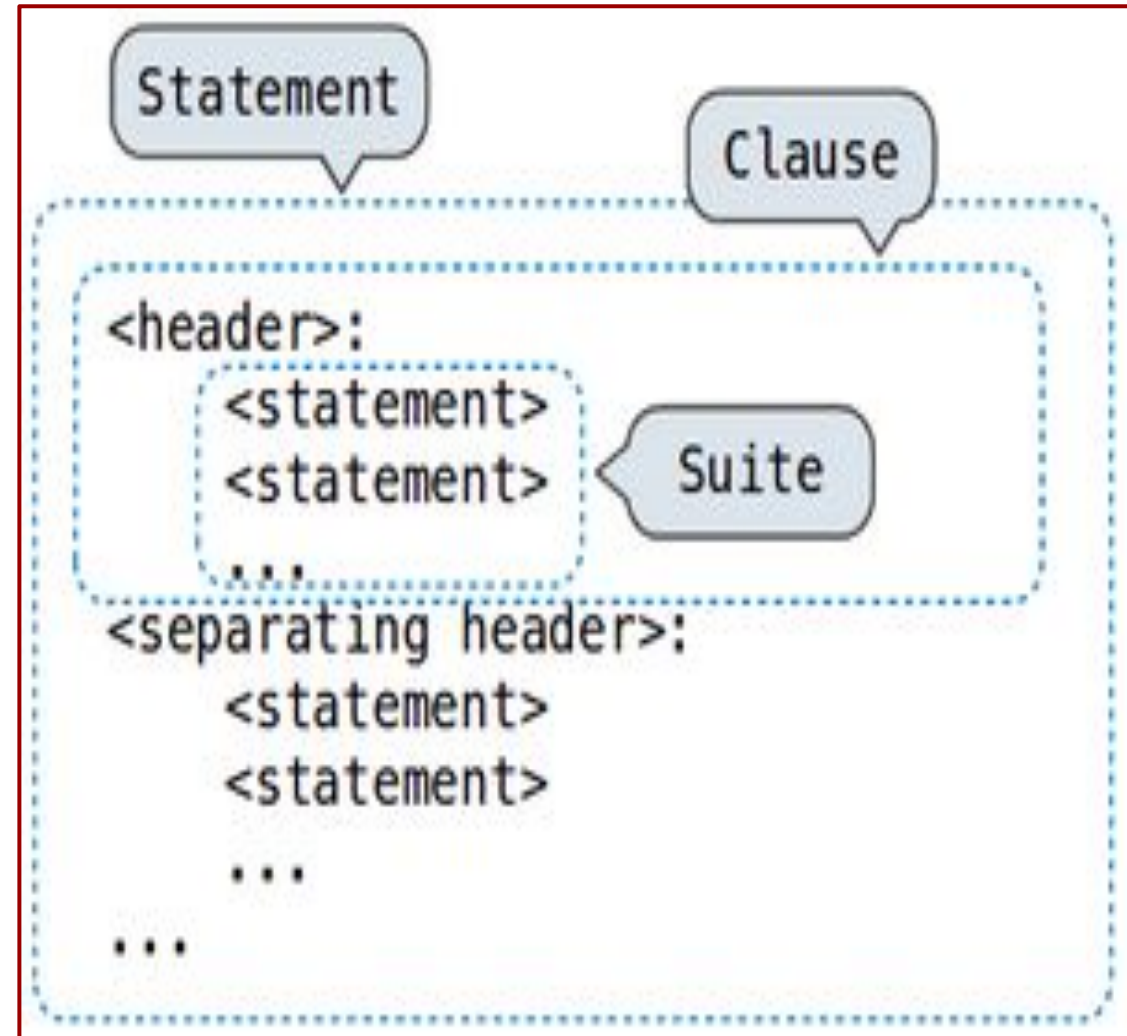
## pCPS 3.3 Selection Control

---

- A **selection control statement** is a control statement providing **selective execution** of instructions.
- A **selection control structure** is a given set of instructions and the selection control statement(s) controlling their execution.

## pCPS 3.3.2 Indentation in python

- One fairly unique aspect of python is that the amount of indentation of each program line is significant.
- In most programming languages, indentation has no effect on program logic, is simply used to align program lines to aid readability.
- In python, however, indentation is used to associate and group statements
- A header in python is a specific keyword followed by a colon



## pCPS 3.3.2 Indentation in python

- The set of statements following a **header** in python is called a **suite** (commonly called a block ).
- The statements of a given **suite** must **all** be **indented** the **same** amount.
- A **header** and its **associated suite** are together referred to as a **clause** .
- A **compound statement** in python may consist of one or more clauses.
- While **four** spaces is **commonly** used for each level of indentation, **any** number of **spaces** may be used

Valid Indentation		Invalid Indentation					
(a)	<pre>if condition:     statement     statement else:     statement     statement</pre>	(b)	<pre>if condition:     statement     statement else:     statement     statement</pre>	(c)	<pre>if condition:     statement     statement else:     statement     statement</pre>	(d)	<pre>if condition:     statement     statement else:     statement     statement</pre>

## pCPS 3.3.2 Indentation in python

```
if(True):  
    print('clause 1')  
    print('Indentation1')  
    print('Part of the clause 1 suite')  
print('Not a part of the clause')
```

clause 1  
Indentation1  
Part of the clause 1 suite  
Not a part of the clause

```
if(True):  
    print('clause 1')  
        print('Indentation1')  
    print('Part of the clause 1 suite')  
print('Not a part of the clause')
```

File "/tmp/ipykernel\_5909/1248515182.py", line 3  
 print('Indentation1')  
 ^

IndentationError: unexpected indent

```
if(True):  
    print('clause 1')  
    print('Indentation1')  
    print('Part of the clause 1 suite')  
print('Not a part of the clause')
```

clause 1  
Indentation1  
Part of the clause 1 suite  
Not a part of the clause



## pCPS 3.3.2 Indentation in python

```
if(False):
    print('clause 1')
    print('Indentation of if ')
    print('Part of the clause 1 suite')
else:
    print('clause 2')
    print('Indentation of else')
    print('Part of the clause 2 suite')

print('Not a part of the clause')
```

```
clause 2
Indentation of else
Part of the clause 2 suite
Not a part of the clause
```

```
if(False):
    print('clause 1')
    print('Indentation of if ')
    print('Part of the clause 1 suite')
else:
    print('clause 2')
    print('Indentation of else')
    print('Part of the clause 2 suite')

print('Not a part of the clause')
```

```
File "/tmp/ipykernel_5909/3466253326.py", line 7
    print('Indentation of else')
    ^
```

IndentationError: unexpected indent

## pCPS 3.3.2 Indentation in python

```
if(False):  
    print('clause 1')  
    print('Indentation of if ' )  
    print('Part of the clause 1 suite')  
else:  
    print('clause 2')  
    print('Indentation of else')  
    print('Part of the clause 2 suite')  
  
print('Not a part of the clause')
```

```
File "<tokenize>", line 5  
    else:  
    ^
```

IndentationError: unindent does not match any outer indentation level



## pCPS 3.3.1 if Statement

- An **if statement** is a selection control statement based on the value of a given Boolean expression
- Note that if statements may omit the “**else**” part

```
A = int(input('Enter value for A: '))
B = int(input('Enter value for B: '))
C = int(input('Enter value for C: '))

if(A>B) and (A>C):
    print(A, ' A is the biggest number')

if (B>A) and (B>C):
    print(B, ' B is the biggest number')

if (C>A) and (C>B):
    print(C, 'C is the biggest number')
else:
    print('All are Equal')
```

```
Enter value for A: 1
Enter value for B: 1
Enter value for C: 1
All are Equal
```

## pCPS 3.3.3 Multi-Way Selection

- **Two** means of constructing **multi-way** selection in python, one involving multiple **nested if** statements, and the other involving a **single if** statement and the use of **elif** headers

### Nested if statements

```
if condition:
    statements
else:
    if condition:
        statements
    else:
        if condition:
            statements

etc.
```

```
A = int(input('Enter value for A: '))
B = int(input('Enter value for B: '))
C = int(input('Enter value for C: '))
```

```
if(A>B) and (A>C):
    print(A, ' A is the biggest number')
else:
    if (B>A) and (B>C):
        print(B, ' B is the biggest number')
    else:
        if (C>A) and (C>B):
            print(C, 'C is the biggest number')
        else:
            print('All are Equal')
```

```
Enter value for A: 10
Enter value for B: 1000
Enter value for C: 999
1000 B is the biggest number
```

## pCPS 3.3.1 The elif Header in python

- If statements may contain only one else header.
- if-else statements must be nested to achieve multi-way selection.
- python, however, has another header called elif (“else-if”) that provides multi-way selection in a single if statement

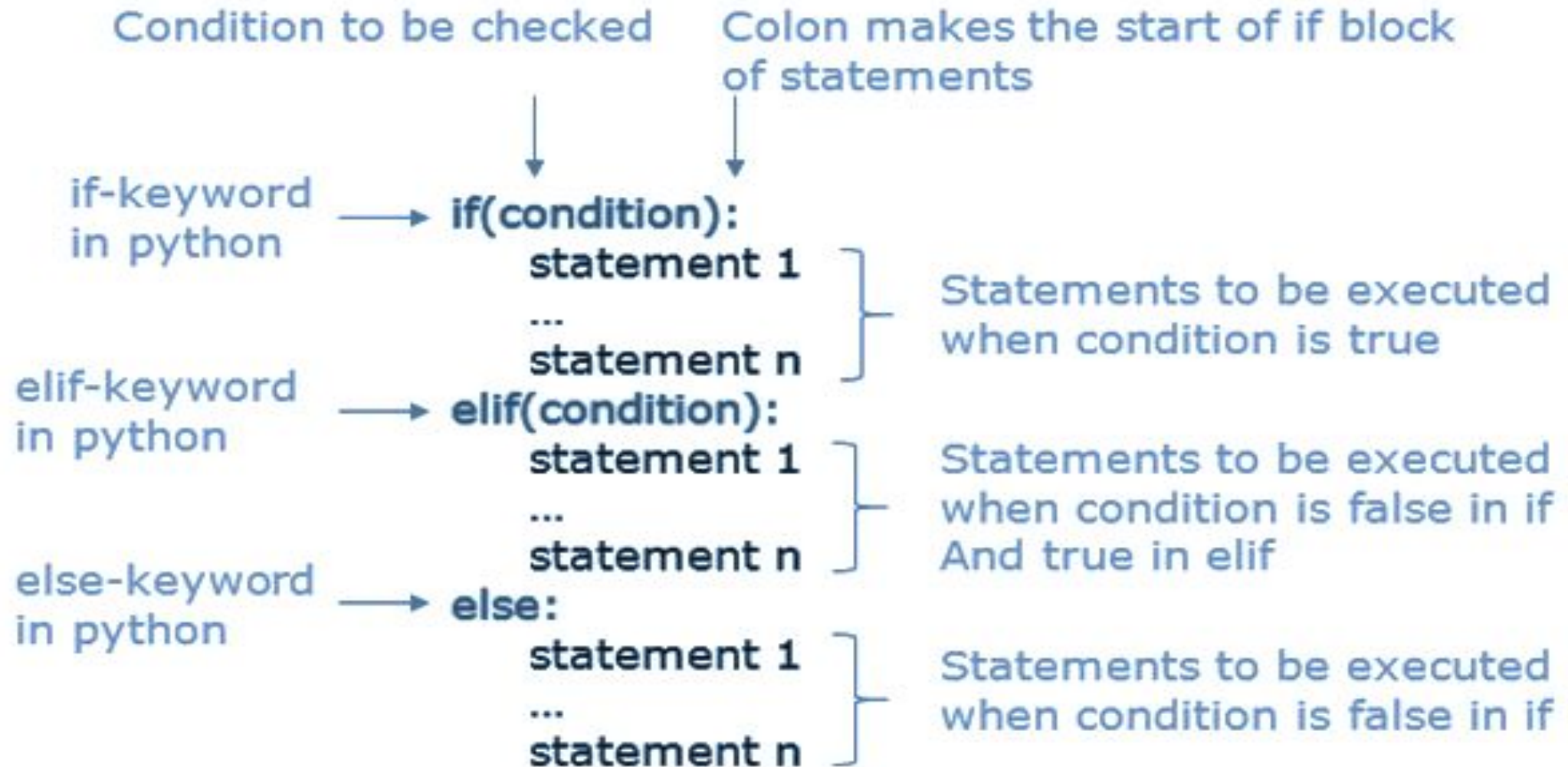
```
A = int(input('Enter value for A: '))
B = int(input('Enter value for B: '))
C = int(input('Enter value for C: '))

if(A>B) and (A>C):
    print(A, ' A is the biggest number')
elif (B>A) and (B>C):
    print(B, ' B is the biggest number')
elif (C>A) and (C>B):
    print(C, 'C is the biggest number')
else:
    print('All are Equal')
```

```
Enter value for A: 1
Enter value for B: 1
Enter value for C: 1
All are Equal
```



## pCPS 3.3.1 The elif header aka else -if ladder statement in python



## pCPS 3.3.1 The if Header in python - Example

```
Marks = int(input('How many marks can you score in pCPS ? Any guess ? '))
print('Entered Marks: ', Marks)
print('Grading Policy Followed: Absolute')
if (Marks>100):
    print('Marks entered should be between inclusive 0 and 100 ')

if (Marks>=0) and (Marks<40):
    print('You got an F grade ')

if (Marks>=40) and (Marks<50):
    print('You have passed with an E grade ')

if (Marks>=50) and (Marks<60):
    print('You have passed with an D grade ')

if (Marks>=60) and (Marks<70):
    print('You have passed with an C grade ')

if (Marks>=70) and (Marks<80):
    print('You have passed with an B grade ')

if (Marks>=80) and (Marks<90):
    print('You have passed with an A grade ')

if (Marks>=90) and (Marks<=100):
    print('You have passed with an S grade ')

print('Provisional Results')
```

```
How many marks can you score in pCPS ? Any guess ? 67
Entered Marks: 67
Grading Policy Followed: Absolute
You have passed with an C grade
Provisional Results
```



## pCPS 3.3.1 The if-else Header in python - example

```
Marks = int(input('How many marks can you score in pCPS ? Any guess ? '))
print('Entered Marks: ', Marks)
print('Grading Policy Followed: Absolute')
if (Marks>100):
    print('Marks entered should be between inclusive 0 and 100 ')

if (Marks>=0) and (Marks<40):
    print('You got an F grade ')
else:
    if (Marks>=40) and (Marks<50):
        print('You have passed with an E grade ')
    else:
        if (Marks>=50) and (Marks<60):
            print('You have passed with an D grade ')
        else:
            if (Marks>=60) and (Marks<70):
                print('You have passed with an C grade ')
            else:
                if (Marks>=70) and (Marks<80):
                    print('You have passed with an B grade ')
                else:
                    if (Marks>=80) and (Marks<90):
                        print('You have passed with an A grade ')
                    else:
                        if (Marks>=90) and (Marks<=100):
                            print('You have passed with an S grade ')

print('Provisional Results')
```

```
How many marks can you score in pCPS ? Any guess ? 67
Entered Marks: 67
Grading Policy Followed: Absolute
You have passed with an C grade
Provisional Results
```

## pCPS 3.3.1 The elif Header in python - example

```
Marks = int(input('How many marks can you score in pCPS ? Any guess ? '))
print('Entered Marks: ', Marks)
print('Grading Policy Followed: Absolute')
if (Marks>100):
    print('Marks entered should be between inclusive 0 and 100 ')
elif (Marks>=0) and (Marks<40):
    print('You got an F grade ')

elif (Marks>=40) and (Marks<50):
    print('You have passed with an E grade ')

elif (Marks>=50) and (Marks<60):
    print('You have passed with an D grade ')

elif (Marks>=60) and (Marks<70):
    print('You have passed with an C grade ')

elif (Marks>=70) and (Marks<80):
    print('You have passed with an B grade ')

elif (Marks>=80) and (Marks<90):
    print('You have passed with an A grade ')

elif (Marks>=90) and (Marks<=100):
    print('You have passed with an S grade ')

print('Provisional Results')
```

```
How many marks can you score in pCPS ? Any guess ? 67
Entered Marks: 67
Grading Policy Followed: Absolute
You have passed with an C grade
Provisional Results
```



**THANK YOU**



**Nitin V Pujari**  
Faculty, Computer Science  
Dean - IQAC, PES University  
[nitin.pujari@pes.edu](mailto:nitin.pujari@pes.edu)

For Course Digital Deliverables visit [www.pesuacademy.com](http://www.pesuacademy.com)